VERIFICATION OF TRANSLATION

I, the below-named person, hereby certify that I am familiar with both the Japanese and the English language, that I have reviewed the attached English translation of U.S. Patent Application Serial No. 10/694,992, filed November 7, 2003, and that the English translation is an accurate translation of the corresponding Japanese language paper.

I further declare that all statements made in this declaration of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of legal decisions of any nature based on them.

Dec. 9, 2003
Date

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SPECIFICATION

TITLE OF THE INVENTION

SHEET FEEDER IN IMAGE FORMING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a sheet feeder in an image forming apparatus to convey special sheet on the same conveying path for ordinary sheet in image forming apparatus such as copier, printer, etc.

2. Description of the Related Art

In electro-photographic type image forming apparatus such as copiers, printers, etc., standard-size ordinary sheet of high using frequency are supplied using sheet cassettes while sheet of low using frequency are generally supplied using a manual sheet supply tray. In the case of sheet supply from a manual sheet supply tray, various kinds of sheet placed on the manual supply tray are taken out by a pick-up roller and then, supplied to aligning rollers by way of a sheet guide. In such an apparatus, side rollers are adjustably provided to the manual sheet supply tray to control the sheet width in order to prevent skew of sheet on a conveying path from the sheet supply tray to the aligning rollers.

However, in the case of special sheet such as postcards, other cards, etc. which are different from ordinary sheet in material, larger in mass and relatively smaller in size than ordinary sheet,

sheet supply rollers for supplying ordinary sheet have no enough energy and cannot be able to obtain sufficient conveying power for conveying sheet between sheet supply rollers and aligning rollers, and sheet may possibly be skewed on the sheet guide. Particularly, when aligning rollers for vertical conveyance are used in company with the downsizing of an image forming apparatus, sheet skew tended to occur on sheet guide while special sheet supplied from a horizontal sheet supply tray was guided vertically in the direction of aligning rollers.

As a countermeasure to prevent the skew of sheet, a sheet supply construction to prevent various kinds of standard-size sheet from tilting by providing ribs of which width is widened gradually according to standard-sizes of sheet on the outside of the curved portion to reverse standard-size sheet supplied from sheet supply cassettes is disclosed in the Japanese Patent Disclosure No. 6-284168 as a measure to prevent the sheet skew. Further, a sheet feeder provided with ribs to the side guide plated corresponding to sheet widths to prevent skew when standard-size sheet supplied from sheet supply cassettes are vertically conveyed is disclosed in the Japanese Patent Diosclosure No. 7-76438.

However, the outside walls of the curved portion or the side guide plates provided with the ribs are to prevent the skew of standard-side sheet supplied from sheet supply cassettes and not for preventing skew when special sheet of postcard, other cards, etc. which are large in mass and relatively small in size are manually supplied.

Accordingly, a sheet feeder of an image forming apparatus capable of positively conveying special sheet of postcard, other cards, etc. which are large in mass and relatively small in size without cause skew using a manual sheet supply tray for ordinary sheet is demanded.

SUMMARY OF THE INVENTION

It is an object of this invention to prevent skew of special sheet which are large in mass and relatively small in size when conveyed to aligning rollers from a manual sheet supply tray without impairing the conveying efficiency of ordinary sheet.

According to the embodiment of this invention, the sheet feeder of this invention is provided with a manual sheet supply unit to supply special sheet and other sheet than the special sheet, a conveying member to convey the special sheet and other sheet than the special sheet supplied from the manual sheet supply unit in the image forming direction and special ribs provided between the manual sheet supply unit and the conveying member to control both sides of the special sheet. The special sheet are inserted between the special sheet ribs and guided while other sheet than the special sheet are guided by a sheet guide by passing the upper surface of the special sheet ribs.

Further, according to the embodiment of this invention, the sheet feeder is provided with a manual sheet supply unit to supply special sheet and other sheet than the special sheet on the manual sheet supply tray, aligning rollers to align the leading edges of the

special sheet and other sheet than the special sheet supplied from the manual sheet supply unit and convey in the image forming direction, special sheet ribs provided between the manual sheet supply unit and the aligning roller to control both sides of the special sheet, and a sheet guide to guide the special sheet by inserting them between the special sheet ribs and guide sheet other than the special sheet by passing the upper surface of the special sheet ribs.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic explanatory diagram showing a sheet conveying path of an image forming apparatus in an embodiment of this invention;

FIG. 2 is a construction diagram showing a manual sheet conveying portion of the embodiment of this invention;

FIG. 3 is a schematic perspective diagram showing a sheet guide in the embodiment of this invention.

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of this invention will be explained below in detail referring to the attached drawings. FIG. 1 is a schematic explanatory diagram showing a sheet conveying path 10a of an image forming apparatus 10 in an embodiment of this invention. Image forming apparatus 10 processes various image forming jobs according to normal copier functions, printer function for image forming on sheet P according to image data input from

personal computers or further, facsimile function to form images on sheet P according to image data fed from telephone circuits.

An image forming apparatus 10 conveys sheet P supplied from a sheet cassette 7 or a manual supply sheet feeder 11 vertically to the position of a transferring charger 3 provided around a photo-sensitive drum 2 for obtaining a toner image by the electro-photographic system. After the transfer of a toner image is completed, the toner image is fixed by a fixing device, the sheet with a toner image fixed thereon is discharged into a sheet receiving tray 6 provided in the horizontal direction.

Manual feed sheet conveying section 11 shown in FIG. 2 conveys sheet P from a manual sheet supply unit 12 to an aligning roller 14 that is an aligning member through a sheet guide 13. Paper supply unit 12 has a manual sheet supply tray 15 on which sheet P in different sizes or materials are placed almost horizontally. On the bottom surface of manual sheet supply tray 15, side guides 15a to prevent skew of sheet P by defining both sides of various kinds of sheet are attached in the state to be able to slide in the direction orthogonal to the sheet supply direction. Paper supplied from manual sheet supply tray 15 is not restricted to standard-size ordinary sheet such as, for example, A4, A3 sizes, etc. or special sheet such as postcards and other cards in larger mass than standard-size sheet.

At a position opposite to manual sheet supply tray 15, there is a pick-up roller 16 that descend onto sheet P while oscillating when supplying sheet. At the end of manual sheet supply tray 15, there

are provided a sheet supply roller 17 and a separation seat 17a to separate sheet P taken out by pick-up roller 16 and supply in the direction of sheet guide 13. Aligning roller 14 aligns the leading edges of sheet P supplied from manual sheet supply tray 15 in the vertical state and conveys in the direction of transferring charger 3, that is the direction of the image forming unit. Paper guide 13 is provided between manual sheet supply feeder 11 and aligning roller 14.

Paper guide 13 is formed in the curved shape in order to lead sheet P horizontally placed in on manual sheet supply tray 15 vertically to aligning roller 14. As shown in FIG. 3, special sheet rib pairs 18a to regulate the width of postcard in 100 x 148 mm and the mass 160 ~ 219 g/m^2, special sheet are formed on the central portion of sheet guide 13. Further, supporting ribs 18b in the same height as special sheet ribs 18a are formed on sheet guide 13 to support standard-size ordinary sheet P2 (mass: 60 ~ 110 g/m^2) other than special sheet.

There is a Mylar™ 20 provided between special sheet rib pairs 18a as pressing members to push up the end of ordinary sheet P2 passing through sheet guide 13. Mylar 20 is attached to sheet guide 13 by a mounting portion 20a
to oscillate and when a postcard P1 passes, mylar 20 is pushed down.

Next, the operation will be explained. When post cards P1 are placed on manual sheet supply tray 15 and the image forming process is started, postcard P1 at the top position is taken out by a

pick-up roller that rotates in the arrow direction q, and separated and supplied in the direction of sheet guide 13 by a sheet supply roller 17 that rotates in the arrow direction r and a separation seat 17a. Then, postcard P1 is inserted between special sheet rib pairs 18a of sheet guide 13 and conveyed vertically to aligning roller 14 while its both sides are regulated by special sheet rib pairs 18a.

At this time, mylar 20 is descended by an empty weight of postcard P1. Therefore, both sides of postcard P1 are regulated sufficiently by special sheet rib pairs 18a and reaches a aligning roller 14 without skewed. Hereafter, postcard P1 is conveyed vertically in the direction of transferring charger 3 of image forming apparatus 10 in synchronous with a toner image on photo-sensitive drum 2 by aligning roller 14. At the position of transferring charger 3, the toner image on photo-sensitive drum 2 is transferred on postcard P1 and after the toner image is fixed, postcard P1 is discharged on sheet discharge tray 6.

Then, ordinary sheet P2 is taken out from manual sheet supply tray 15 by pick-up roller 16 likewise postcard P1 and separated and supplied in the direction of sheet guide 13 by sheet supply roller 17 and separation seat 17a. Ordinary sheet P2 supplied to sheet guide 13 passes the upper surfaces of special sheet rib 18a and support rib 18b of sheet guide 13, and vertically conveyed to aligning roller 14 with its back supported. At this time, mylar 20 prevents the bending of the central portion of ordinary sheet P2 by pressings the back of the central portion of ordinary sheet P2 by its elastic force.

Hereafter, leading edges of ordinary sheet P2 are aligned at the

position of aligning roller 14 by the sheet supply force of sheet supply roller 17 and conveyed vertically in the direction of transferring charger 3 of image forming apparatus 10 in synchronous with a toner image on photo-sensitive drum 2 likewise postcard P1. Thereafter, ordinary sheet P2 is discharged on sheet discharged sheet receiving tray 6 after the transferring process and the fixing process.

The image forming was made with this image forming apparatus 10 by supplying sheet using manual sheet supply tray 15. As a result, postcards P1 could be conveyed satisfactorily without causing skew and a good image was obtained on ordinary sheet P1 without generating such a defect as image void at the central portion.

According to this embodiment, special sheet rib 18a is provided at the center of sheet guide 13 which leads sheet P to aligning roller 14 from manual sheet supply tray 15 for inserting postcard P1 and controlling its both side and therefore, postcard P1 can be conveyed vertically to aligning roller 14 without causing the skew even when the sheet supply force of sheet supply roller 17 is not increased. Further, it is also possible to convey ordinary sheet P1 vertically to aligning roller 14 while supporting its back by special sheet rib 18a likewise another support rib 18b without bending the central portion.

Furthermore, as the back of the central portion of ordinary sheet P1 is pressed by mylar 20, the bending of the cener is prevented surely in spite of somewhat wider distance between special sheet ribs 18a and a good image is obtained without causing

defecting images. Accordingly, both ordinary sheet P2 and postcard P1 can be satisfactorily conveyed vertically from manual sheet supply tray 15 and a good image can e formed and it becomes possible to achieve the practical use of a small image forming apparatus.

Further, this invention is not restricted to the embodiment described above but cane be modified variously within the scope of the invention. For instance, an image forming apparatus can be a color image forming apparatus or a dual image forming apparatus and the number of sheet cassettes to supply standard-size ordinary sheet, kinds of ordinary sheet and the like are optional. Further, special sheet that are supplied by a manual sheet supply unit is also not restricted to postcards and material, mass and size are optional.

According to this invention as described above in detail, even when special sheet in large mass and small size is conveyed in the vertical direction after supplied from the manual sheet supply unit, skew of special sheet can be prevented without increasing the conveying force of the sheet supply roller by inserting special sheet between the special sheet ribs formed on the sheet guide. Further, when sheet other than special sheet is supplied from the manual sheet supply unit, defective image caused by bending of sheet can be prevented when the sheet is passed the upper surface of the special sheet ribs of the sheet guide. Accordingly, special sheet and sheet other than special sheet supplied from the manual sheet supply unit can be conveyed satisfactorily regardless of the conveying direction and the practical application of a small sized image forming

apparatus for a good image formation can be achieved.